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King's House School
68 King's Road
Richmond
TW10 6ES

# Flood Risk Assessment
# BREEAM 2018 POL 03

| | |
|---|---|
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| Status: | Preliminary |
| Date: | January 2021 |

## Document Control

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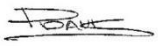
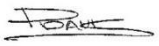
| date | 12/01/21 | signature: |  | signature: |  | signature: |  |

# CONTENTS

# 1.0 BREEAM Summary

1.1.1 This report summarises the credits that the development at Kings House School, 68 King's Road, Richmond can achieve under BREEAM 2018 POL 03.

1.1.2 5 potential credits are available under POL 03. This report assesses the two potential credits available under "Flood Risk". Due to the nature of the development, the three additional credits available under POL 03, Surface water run-off and Minimising Watercourse pollution, are not achievable for this development.

1.1.3 As outlined in the Flood Risk Assessment report below, the site has been reviewed for potential flood risk from all sources. Following this review, it has been deemed that the site is at **low risk** of flooding. Therefore, it is recommended that **2 credits** can be awarded.

# 2.0 Flood Risk Assessment

## 2.1 General Information

2.1.1 Elliott Wood have been appointed by King's House School, to undertake a Flood Risk Assessment (FRA) to accompany the BREEAM assessment for the development at King's House School, Richmond. The proposed development involves the demolition of some of the central school buildings, and the construction of a new multi-use classroom building to the south east of the site. The scheme also involves an extension of the existing sports hall and the creation of a new central courtyard/quad.

2.1.2 This FRA will assess the risk of flooding to the proposed development and assess how many credits the development can achieve under BREEAM 2018 POL 03.

# 3.0 Site Description

## 3.1 Site Location

3.1.1 The existing site is located in the London Borough of Richmond upon Thames, approximately 750m southeast of Richmond Station. Refer to Figure 1 for the site location plan.

## 3.2 Existing Development

3.2.1 King's House school is an independent preparatory school located within a residential area of Richmond, London. The school is formed of a mix of buildings of various types, with two converted Victorian residential properties at the street frontage on Kings Road, with a number of more modern extensions to the rear.

## 3.3 Proposed Development

3.3.1 The proposed development involves the demolition of some areas of the existing buildings, and the construction of a new classroom block at the rear of the site. The proposals involve modifications to the existing sports hall, and the creation of a new central "quad" area. The total development area which will be affected by the works is approximately 895m$^2$. The total increase in impermeable equates to approximately 345m$^2$.


**Figure 1** - Development Site Location (© Bing Maps. Microsoft product screen shot reprinted with permission from Microsoft Corporation)

### 3.4 Topographic Survey

3.4.1 A topographic survey has been completed by CPB Surveys in April 2015. This can be found in **Appendix A**. The site falls quite steeply from south to north, with approximately 2.0m level difference at the front of the site along Kings Road. To the rear (east) of the site, the site levels flatten off with a level difference from south to north of approximately 0.7m.

### 3.5 Existing Drainage

3.5.1 Sewer records have been obtained from Thames Water to confirm the location, size and depth of the surrounding sewer network. The records can be found in **Appendix B**. The records confirmed the off-site sewer network is separated, with a surface water and a foul water sewer present in Kings Road. The records show that a 300mm diameter foul sewer and a 225mm diameter surface water sewer run from south to north in Kings Road.

3.5.2 A CCTV drainage survey of the existing on-site network has been undertaken by Novum Surveys Ltd. The CCTV survey has confirmed that the existing drainage network has a single combined water outfall to the Thames Water sewer network. This is fairly typical for older Victorian era properties, that would have drained to a combined sewer before a dedicated separated sewer network was installed.

# 4.0 Planning and Flood Risk Management Policy

## 4.1 London Borough of Richmond upon Thames Strategic Flood Risk Assessment Level 1 (SFRA)

4.1.1 The London Borough of Richmond upon Thames (LBRT) Strategic Flood Risk Assessment Level 1 (SFRA) was completed by Metis Consultants in March 2016. This report aims to provide a reference and policy document to inform the local development framework and any subsequent plans.

# 5.0 Potential Flooding on Site

## 5.1 Flooding from Rivers and Sea

5.1.1 The site of the proposed development is located within Flood Zone 1 (very low risk), as shown in Figure 2.

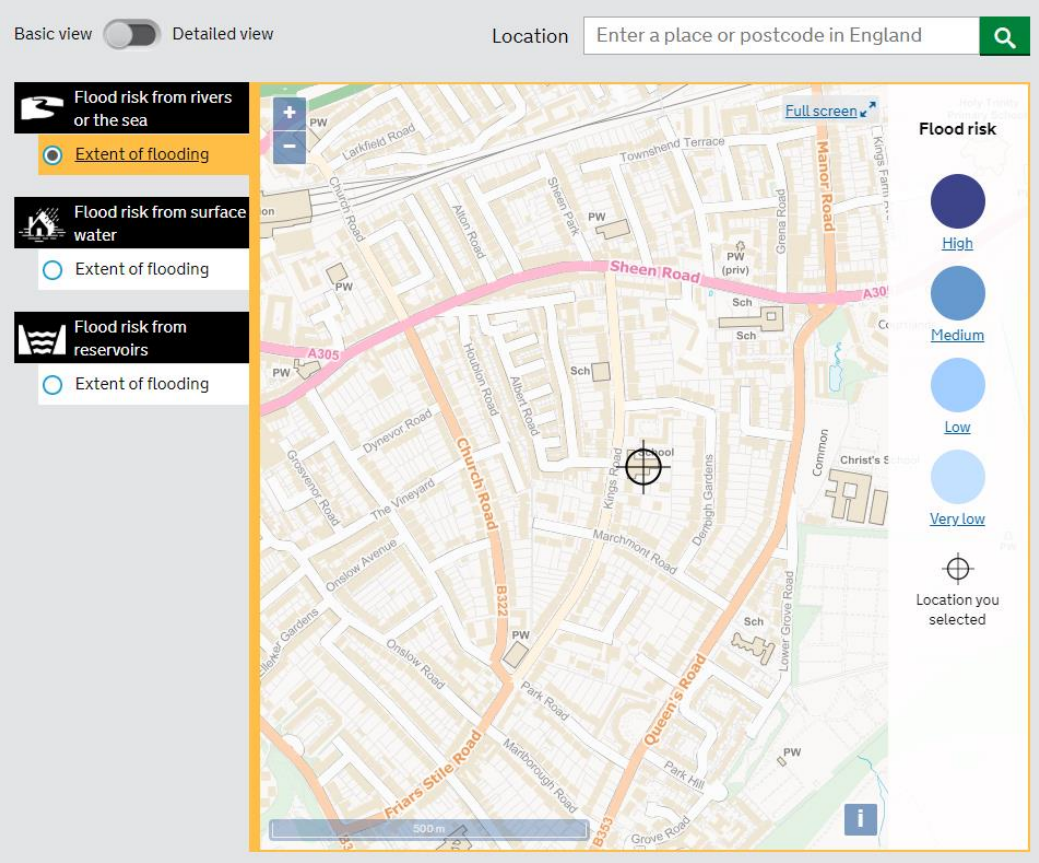



**Figure 2** - Flood Risk from Rivers & Seas Map: Flood Extents (GOV.UK)

5.1.2 Flood Zone 1 (very low risk) is defined as land assessed as having a less than 1 in 1,000 annual probability of river or sea flooding in any given year.

5.1.3 After review of the relevant information, this development is considered to be at a **low risk** of flooding from rivers and seas.

## 5.2 Flooding from Overland Surface Water Flow

5.2.1 Overland rainwater flows occur when the infiltration capacity of the land, or the drainage capacity of the local sewer network is exceeded. The extents of overland flooding will depend upon the rainfall event, the degree of saturation of the soil, the permeability of soils and the topography of the site.

5.2.2 As can be seen in Figure 3, the site, is located within an area of very low risk of surface water flooding.

5.2.3 The flood map show that Kings Road, located to the west of the site, has areas of low risk surface water flooding. However, it appears to be contained within the highway and as such would not pose a risk to the site.

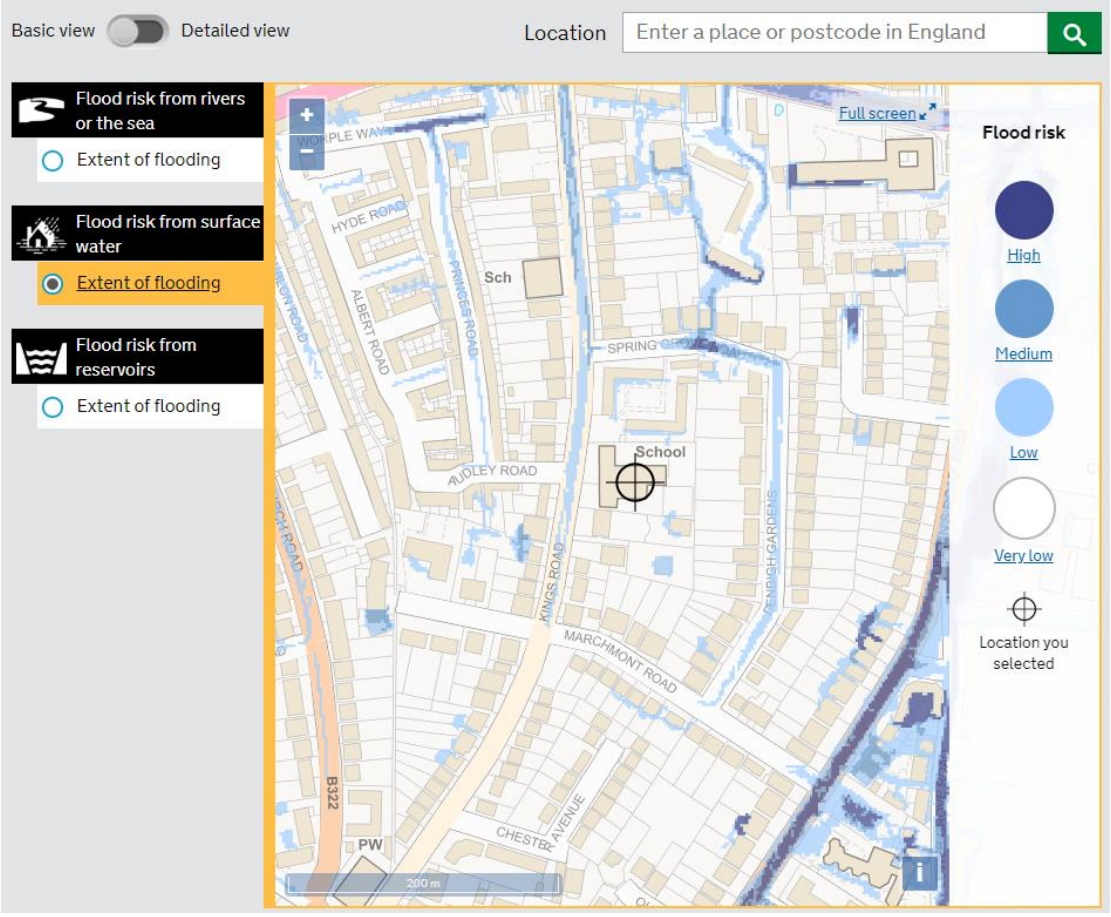



**Figure 3** - Flood Risk from Surface Water Map: Flood Extents (GOV.UK)

5.2.4 After review of the relevant information, this development is considered to be at a **low risk** of flooding from overland surface water flow.

### 5.3 Flooding from Sewers

5.3.1 Thames Water are responsible for operating and maintaining their sewer infrastructure, therefore the likelihood of surcharge due to blockages in the offsite sewers is expected to be low.

5.3.2 The LBRT SFRA shows that the site is located within an area which had between 1 and 5 sewer Flooding Incidents up to 2016, based on DG5 data provided by Thames Water.

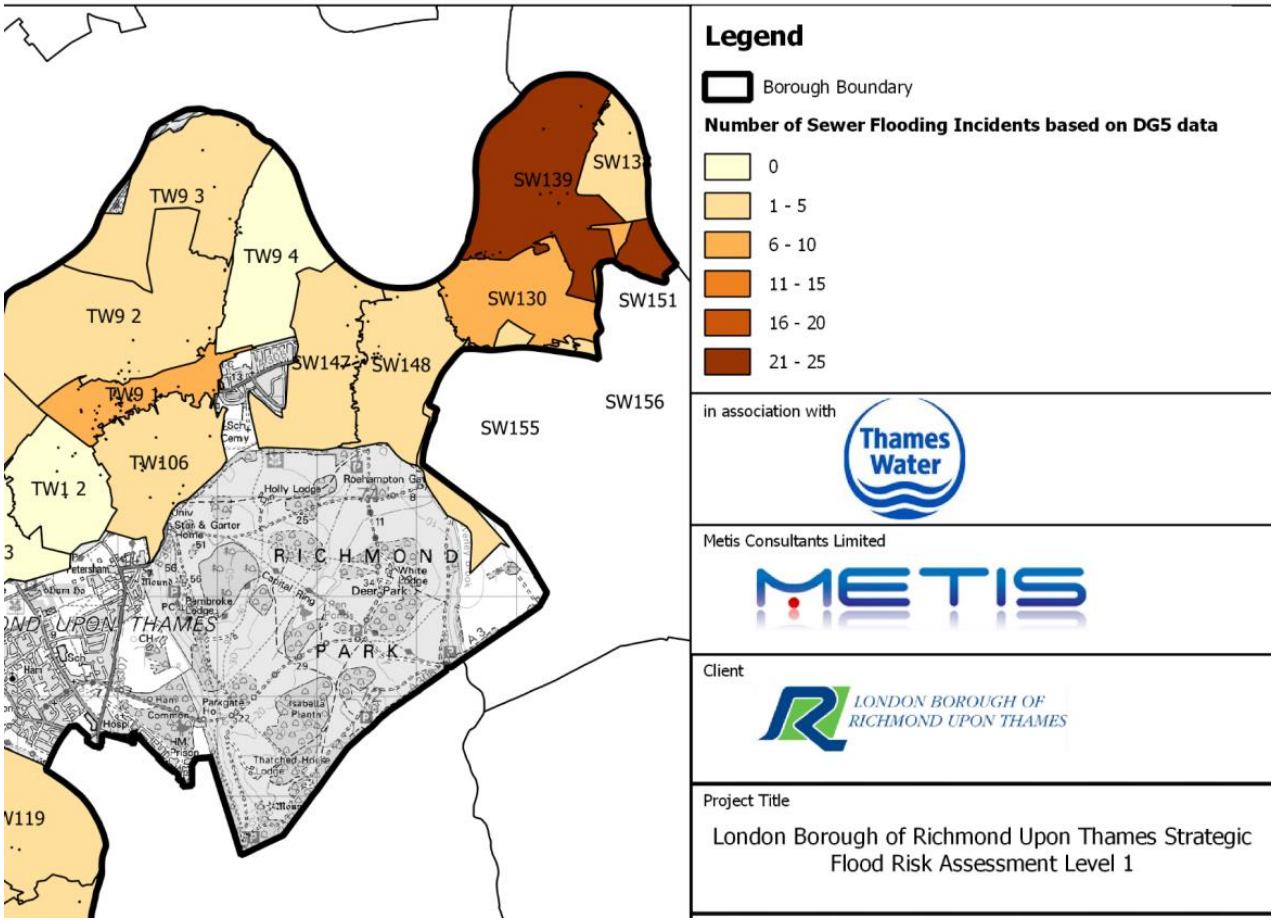



**Figure 4** - London Borough of Richmond upon Thames SFRA: Sewer Flooding Records Map

5.3.3 The site is located on a hill, with Kings Road having steep gradient from south to north. It is therefore deemed that sewer flooding is unlikely to occur in this area due to the steep gradients of the surrounding roads.

5.3.4 The existing site contains a small basement level; however, the proposed works do not involve introducing any new basements or lowering of the existing basement level. Therefore, the risk of sewer flooding to the basement will not be increased.

5.3.5 After review of the relevant information, this development is considered to be at a **low risk** of flooding from sewers.

## 5.4 Flooding from Groundwater

5.4.1 Groundwater flooding can occur following a prolonged period of low intensity rainfall. The future risk from this source is more uncertain than surface water as the climate change predictions indicate that although sea levels will rise, thus possibly raising groundwater levels, overall summer rainfall will decrease, therefore having a long-term effect of lowering the groundwater levels. However, long periods of wet weather are predicted to increase and these are the type of weather patterns that can cause groundwater flooding to occur.

5.4.2 The LBRT SFRA states that a large proportion of the London Borough of Richmond upon Thames "overlays London Clay and consequently the risk of groundwater flooding will typically be low."

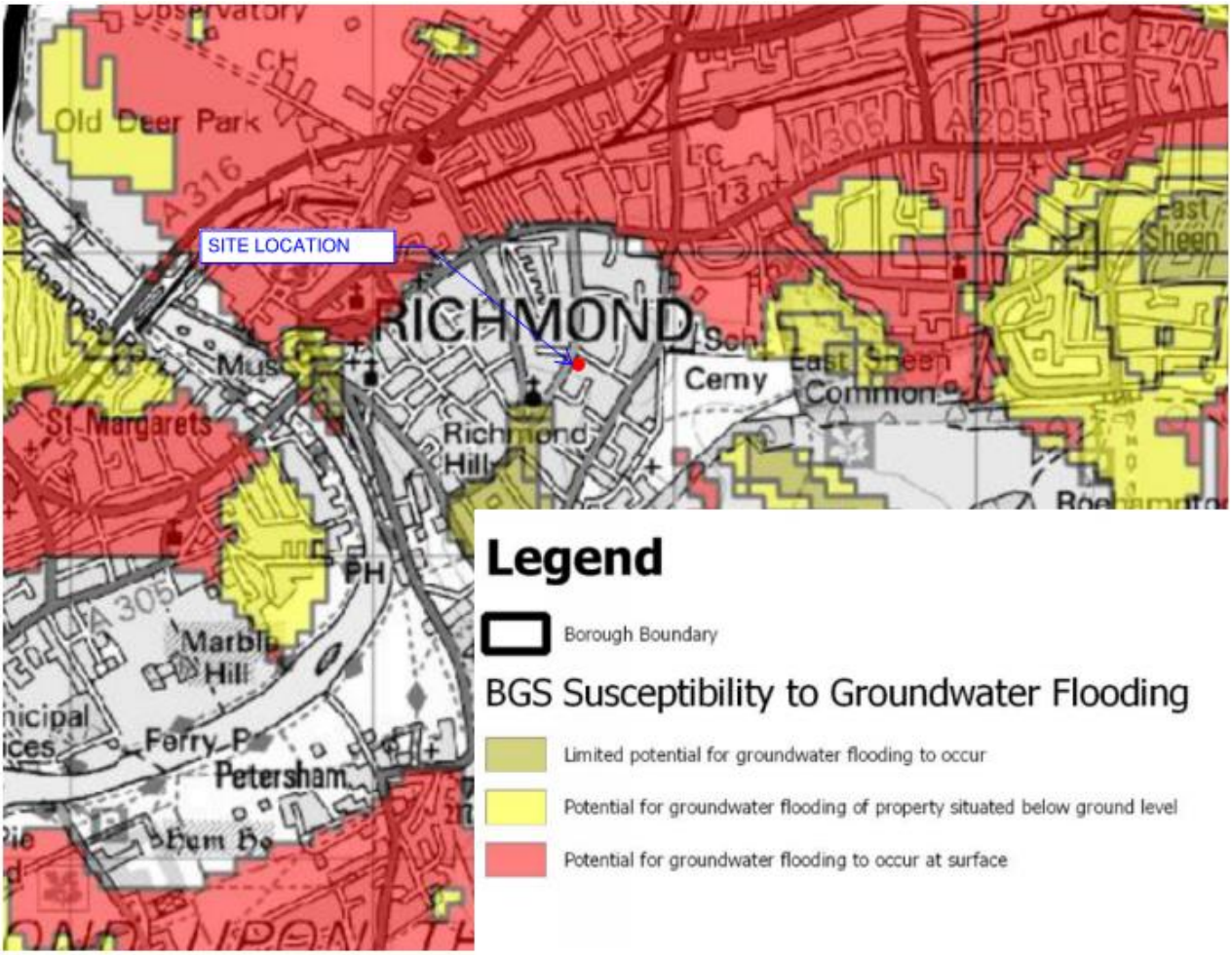



**Figure 5** - London Borough of Richmond upon Thames SFRA: BGS Susceptibility to Groundwater Flooding Map

5.4.3 Figure 5 shows that the site is located with an area not considered to be susceptible to groundwater flooding.

5.4.4 After review of the relevant information, this development is considered to be at a **low risk** of flooding from groundwater.

### 5.5 Flooding from Artificial Water Bodies

5.5.1 Figure 6 has been taken from the GOV.UK Flood Risk Maps. This shows that the site is not located in an area at risk of flooding from artificial water bodies.

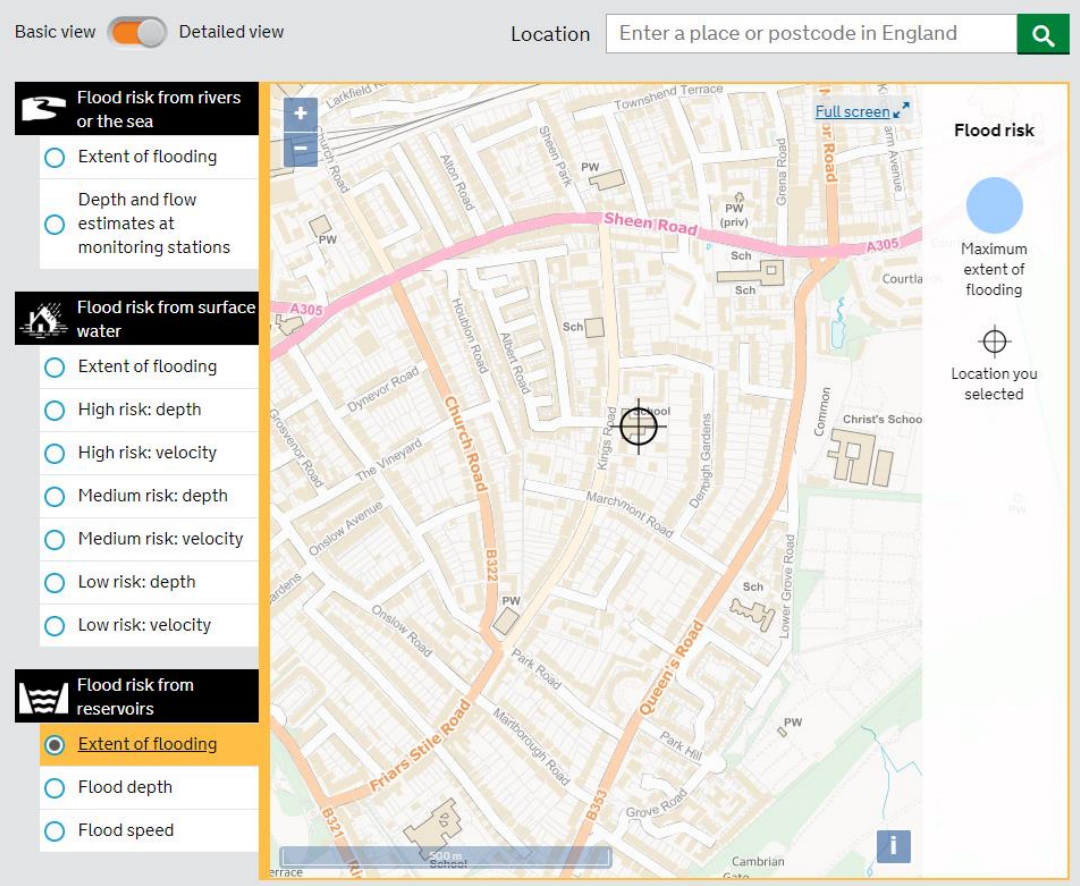


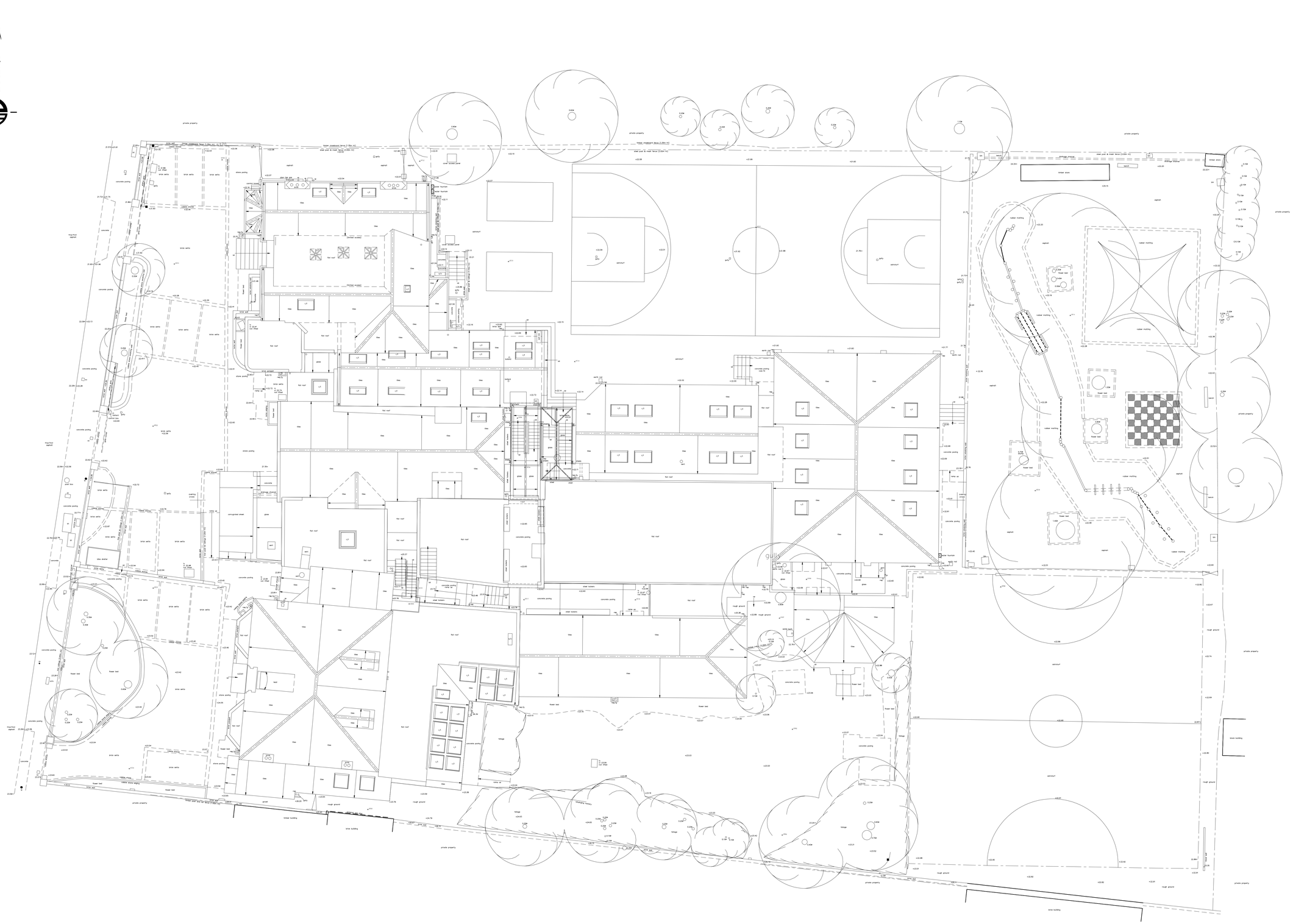

**Figure 6** - Flood Risk from Artificial Water Bodies Map: Flood Extents (GOV.UK)

5.5.2 Based on the above mapping, this development is considered to be at a **low risk** of flooding from artificial water bodies.

## 6.0 Flood Risk Assessment Conclusion

6.1.1 After review, the site has been found to be at a **low risk** of flooding from all sources.

# APPENDIX A – TOPOGRAPHICAL SURVEY




## Notes

This plot has been prepared with a scaling accuracy for a plot at a scale of 1/100.

All levels are in metres and related to GPS.

The co-ordinate grid is based on GPS values.

All tree heights and spreads are approximate.

We have tried to identify tree types, however if tree species are critical specialist advice should be gained.

Drainage pipe sizes have been measured from the surface, chamber access has not been gained for safety reasons, therefore sizes should be regarded as approximate.

| Station | Easting | Northing | Level |
|---|---|---|---|
| ST02 | 518721.790 | 174740.717 | 23.045 |
| ST03 | 518689.649 | 174734.643 | 23.641 |
| ST04 | 518721.017 | 174732.709 | 23.370 |
| ST05 | 518692.779 | 174750.208 | 27.521 |
| ST06 | 518700.970 | 174764.280 | 28.808 |
| ST07 | 518720.807 | 174749.133 | 22.900 |
| ST08 | 518737.556 | 174751.499 | 22.837 |
| ST09 | 518722.850 | 174752.071 | 22.672 |
| ST10 | 518740.171 | 174758.795 | 22.386 |
| ST11 | 518742.827 | 174772.061 | 22.244 |
| ST12 | 518693.571 | 174783.737 | 21.995 |
| ST13 | 518719.035 | 174778.730 | 21.941 |
| ST14 | 518705.309 | 174768.559 | 22.119 |
| ST15 | 518700.292 | 174776.140 | 22.158 |
| ST16 | 518701.537 | 174760.553 | 22.638 |
| ST17 | 518701.470 | 174750.535 | 22.649 |
| ST18 | 518709.899 | 174750.522 | 22.660 |
| ST19 | 518693.323 | 174751.422 | 23.756 |
| ST20 | 518678.612 | 174763.840 | 22.065 |
| ST21 | 518674.995 | 174775.954 | 22.165 |
| ST22 | 518673.386 | 174763.671 | 22.557 |
| ST23 | 518673.398 | 174751.409 | 23.244 |
| ST24 | 518671.589 | 174737.731 | 23.598 |
| ST25 | 518657.636 | 174757.517 | 22.727 |
| ST26 | 518659.164 | 174766.258 | 22.404 |
| ST27 | 518661.434 | 174780.364 | 21.866 |
| ST28 | 518672.425 | 174796.930 | 21.225 |

| | |
|---|---|
| bl | bed level |
| cl | cover level |
| il | invert level |
| tl | threshold level |
| u/l | unable to lift |
| wl | water level |
| wfc | water filled chamber |
| sh | sill to head height |
| fs | floor to sill height |
| u/s | underside height |
| t/s | topside height |
| fb | floorboard direction |
| conc | concrete |
| rl | roof light |
| cup'd | cupboard |
| fp | fireplace |
| sd | sliding door |
| svp | soil and vent pipe |
| rwp | rain water pipe |
| C | carpet |
| 3.17 | room height |

roof slope

radiator

0.5 0.0 1.0 2.0 3.0 4.0 5.0 6.0 7.0 8.0 9.0 10.0

Scale = 1 : 100

CBH/PBH/FM



A0

JOB

Kings House School
66 - 68 Kings Road
Richmond
TW10 6ES

CLIENT

Redmond Ivie Architects

| TITLE | DWG No |
|---|---|
| Land Survey / Roof Plan | 2915/01 |
| SCALE | DATE |
| 1/100 @ A0 | April 2015 |

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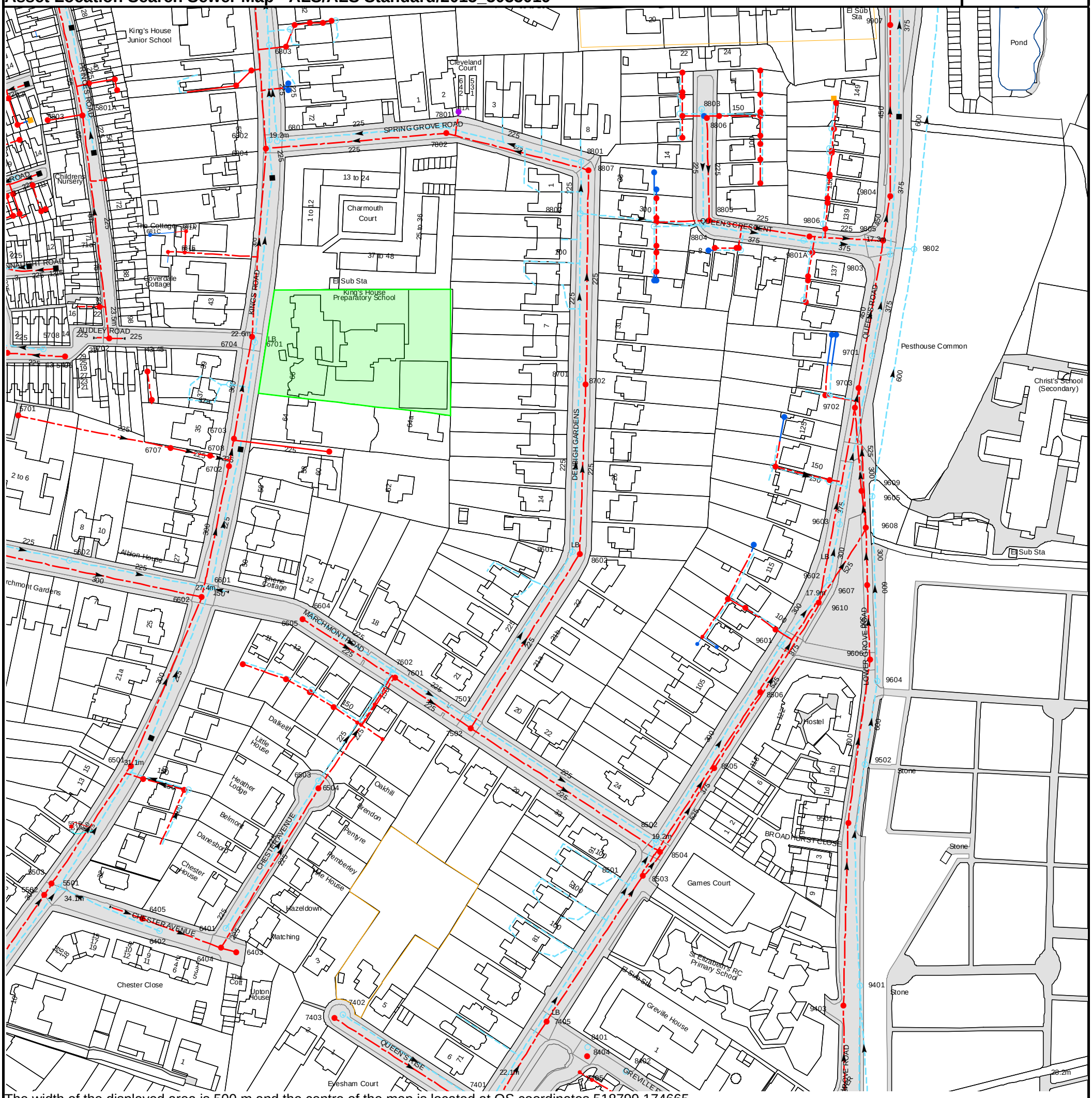
# APPENDIX B – THAMES WATER SEWER RECORDS

# Asset Location Search Sewer Map - ALS/ALS Standard/2015_3033019




The width of the displayed area is 500 m and the centre of the map is located at OS coordinates 518799,174665

**The position of the apparatus shown on this plan is given without obligation and warranty, and the accuracy cannot be guaranteed. Service pipes are not shown but their presence should be anticipated. No liability of any kind whatsoever is accepted by Thames Water for any error or omission. The actual position of mains and services must be verified and established on site before any works are undertaken.**

NB. Levels quoted in metres Ordnance Newlyn Datum. The value -9999.00 indicates that no survey information is available

| Manhole Reference | Manhole Cover Level | Manhole Invert Level |
|---|---|---|
| 88XQ | n/a | n/a |
| 9907 | 15.38 | 10.96 |
| 9610 | 17.76 | 14.64 |
| 9602 | 17.72 | 14.64 |
| 9403 | n/a | n/a |
| 9501 | 19.61 | 16.19 |
| 9401 | n/a | n/a |
| 9502 | 19.28 | 16.69 |
| 9607 | 17.57 | 14.83 |
| 9606 | 18.16 | 15.11 |
| 9604 | 18.39 | 12.83 |
| 58SQ | n/a | n/a |
| 58QP | n/a | n/a |
| 6802 | 19.1 | 16.76 |
| 7802 | 18.5 | 16.67 |
| 7801 | 18.46 | 17.27 |
| 781A | n/a | n/a |
| 68XW | n/a | n/a |
| 68YR | n/a | n/a |
| 68ZR | n/a | n/a |
| 68YT | n/a | n/a |
| 58QQ | n/a | n/a |
| 68ZQ | n/a | n/a |
| 68YP | n/a | n/a |
| 6803 | 17.43 | 16.08 |
| 69YS | n/a | n/a |
| 69YV | n/a | n/a |
| 69YW | n/a | n/a |
| 69YT | n/a | n/a |
| 79ZX | n/a | n/a |
| 69YX | n/a | n/a |
| 58ZY | n/a | n/a |
| 58YW | n/a | n/a |
| 58ZQ | n/a | n/a |
| 58ZW | n/a | n/a |
| 5809 | 20.45 | 19.54 |
| 58XX | n/a | n/a |
| 58SR | n/a | n/a |
| 58QT | n/a | n/a |
| 5801A | 19 | 17.63 |
| 5803 | 19.01 | 17.76 |
| 88VP | n/a | n/a |
| 9801A | 18.12 | 14.87 |
| 9805 | 17.26 | 12.44 |
| 9806 | 18.08 | 14.85 |
| 98XS | n/a | n/a |
| 98YS | n/a | n/a |
| 98XT | n/a | n/a |
| 98XV | n/a | n/a |
| 9804 | 17.04 | 12.17 |
| 88XZ | n/a | n/a |
| 98XW | n/a | n/a |
| 98XX | n/a | n/a |
| 88XX | n/a | n/a |
| 98XY | n/a | n/a |
| 98YT | n/a | n/a |
| 98XZ | n/a | n/a |
| 98YV | n/a | n/a |
| 88XW | n/a | n/a |
| 88XV | n/a | n/a |
| 98YP | n/a | n/a |
| 98YW | n/a | n/a |
| 88XT | n/a | n/a |
| 88XS | n/a | n/a |
| 88WW | n/a | n/a |
| 88WZ | n/a | n/a |
| 98YQ | n/a | n/a |
| 88XP | n/a | n/a |
| 88ZT | n/a | n/a |
| 87YX | n/a | n/a |
| 87YW | n/a | n/a |
| 88ZS | n/a | n/a |
| 88YZ | n/a | n/a |
| 88YQ | n/a | n/a |
| 88YR | n/a | n/a |
| 88YV | n/a | n/a |
| 88YT | n/a | n/a |
| 87YV | n/a | n/a |
| 87YT | n/a | n/a |
| 88WS | n/a | n/a |
| 88WR | n/a | n/a |
| 88WQ | n/a | n/a |
| 88VW | n/a | n/a |
| 88VX | n/a | n/a |
| 88WP | n/a | n/a |
| 88VZ | n/a | n/a |
| 88VY | n/a | n/a |
| 8803 | 17.99 | 15.93 |
| 8804 | 18.12 | 15.61 |
| 88XR | n/a | n/a |
| 8806 | 18 | 15.92 |

| Manhole Reference | Manhole Cover Level | Manhole Invert Level |
|---|---|---|
| 88VV | n/a | n/a |
| 8805 | 18.61 | 15.61 |
| 88VQ | n/a | n/a |
| 86YV | n/a | n/a |
| 9608 | 17.17 | 14.2 |
| 9603 | 17.72 | 10.49 |
| 9605 | 17.22 | 14.89 |
| 9609 | 17.02 | 14.27 |
| 96ZT | n/a | n/a |
| 96ZR | n/a | n/a |
| 97ZV | n/a | n/a |
| 97ZR | n/a | n/a |
| 97ZS | n/a | n/a |
| 9702 | 17.7 | 13.06 |
| 97YS | n/a | n/a |
| 97YZ | n/a | n/a |
| 9703 | 17.76 | 15.53 |
| 9701 | 17.6 | 15.53 |
| 97YX | n/a | n/a |
| 97YV | n/a | n/a |
| 97YQ | n/a | n/a |
| 97XY | n/a | n/a |
| 97YP | n/a | n/a |
| 97XZ | n/a | n/a |
| 9803 | 17.28 | 15.15 |
| 98ZR | n/a | n/a |
| 98ZP | n/a | n/a |
| 88VS | n/a | n/a |
| 9802 | 16.93 | 13.98 |
| 88TZ | n/a | n/a |
| 8602 | 22.87 | 20.97 |
| 8601 | 22.81 | 21.44 |
| 6702 | 24.99 | 22.18 |
| 6708 | n/a | n/a |
| 67YV | n/a | n/a |
| 6707 | n/a | n/a |
| 6703 | 23.94 | 19.56 |
| 67ZX | n/a | n/a |
| 67YY | n/a | n/a |
| 8702 | 21.19 | 19.13 |
| 8701 | 21.09 | 19.64 |
| 67ZY | n/a | n/a |
| 6701 | 22.62 | 21.15 |
| 5702 | 23.31 | 21.36 |
| 6704 | 22.53 | 19.56 |
| 57YW | n/a | n/a |
| 681B | n/a | n/a |
| 681F | n/a | n/a |
| 681C | n/a | n/a |
| 681A | n/a | n/a |
| 88ZR | n/a | n/a |
| 8802 | 19.25 | 18.13 |
| 581B | n/a | n/a |
| 8807 | 18.8 | 16.89 |
| 8801 | 18.73 | 17.47 |
| 6804 | 19.17 | 16.08 |
| 6801 | 18.99 | 16.73 |
| 5706 | 23.8 | 21.44 |
| 58YX | n/a | n/a |
| 5701 | 24.68 | 23.65 |
| 58ZR | n/a | n/a |
| 58ZX | n/a | n/a |
| 5708 | 23.78 | 22.79 |
| 5705 | 23.94 | n/a |
| 5602 | 27.34 | 25.92 |
| 66ZS | n/a | n/a |
| 66ZR | n/a | n/a |
| 6605 | 27.34 | 25.34 |
| 65ZQ | n/a | n/a |
| 6604 | 27.2 | 25.78 |
| 66YY | n/a | n/a |
| 6503 | 29.62 | 26.88 |
| 6504 | 29.64 | 26.51 |
| 75ZV | n/a | n/a |
| 75ZT | n/a | n/a |
| 751C | n/a | n/a |
| 751B | n/a | n/a |
| 751A | n/a | n/a |
| 7602 | 25.85 | 24.45 |
| 7601 | 25.95 | 23.95 |
| 7501 | 24.61 | 22.96 |
| 7502 | 24.6 | 22.59 |
| 8503 | 19.73 | 19.17 |
| 8502 | 19.31 | 18.04 |
| 8504 | 19.35 | 16.05 |
| 86YZ | n/a | n/a |
| 861A | n/a | n/a |
| 8505 | 18.55 | 15.62 |
| 861B | n/a | n/a |
| 86YX | n/a | n/a |
| 86YW | n/a | n/a |
| 8506 | 18.01 | 14.89 |
| 96ZX | n/a | n/a |

| Manhole Reference | Manhole Cover Level | Manhole Invert Level |
|---|---|---|
| 9601 | 18.01 | 16.46 |
| 6403 | 32.22 | 30.62 |
| 6404 | 32.66 | 29.94 |
| 6402 | 33.27 | 30.5 |
| 6401 | 32.4 | 29.73 |
| 6405 | 33.26 | 31.86 |
| 5502 | 34.26 | 30.73 |
| 5501 | n/a | n/a |
| 5503 | 34.06 | 30.45 |
| 551A | n/a | n/a |
| 551B | n/a | n/a |
| 65YX | n/a | n/a |
| 65YS | n/a | n/a |
| 65YW | n/a | n/a |
| 6501 | 30.98 | 28.75 |
| 6602 | 27.73 | 24.66 |
| 6601 | 27.6 | 25.35 |
| 841E | n/a | n/a |
| 8405 | n/a | n/a |
| 8402 | n/a | n/a |
| 8404 | n/a | n/a |
| 8401 | n/a | n/a |
| 7405 | n/a | n/a |
| 7403 | 28.33 | 26.25 |
| 7402 | 28.43 | 26.6 |
| 8501 | 19.73 | 18.43 |

# ALS Sewer Map Key

## Public Sewer Types (Operated & Maintained by Thames Water)

**Foul:** A sewer designed to convey waste water from domestic and industrial sources to a treatment works.

**Surface Water:** A sewer designed to convey surface water (e.g. rain water from roofs, yards and car parks) to rivers or watercourses.

**Combined:** A sewer designed to convey both waste water and surface water from domestic and industrial sources to a treatment works.

Trunk Surface Water

Trunk Foul

Storm Relief

Trunk Combined

Vent Pipe

Bio-solids (Sludge)

Proposed Thames Surface Water Sewer

Proposed Thames Water Foul Sewer

Gallery

Foul Rising Main

Surface Water Rising Main

Combined Rising Main

Sludge Rising Main

Proposed Thames Water Rising Main

Vacuum

## Sewer Fittings

A feature in a sewer that does not affect the flow in the pipe. Example: a vent is a fitting as the function of a vent is to release excess gas.

Air Valve

Dam Chase

Fitting

Meter

Vent Column

## Operational Controls

A feature in a sewer that changes or diverts the flow in the sewer. Example: A hydrobrake limits the flow passing downstream.

Control Valve

Drop Pipe

Ancillary

Weir

## End Items

End symbols appear at the start or end of a sewer pipe. Examples: an Undefined End at the start of a sewer indicates that Thames Water has no knowledge of the position of the sewer upstream of that symbol, Outfall on a surface water sewer indicates that the pipe discharges into a stream or river.

Outfall

Undefined End

Inlet

## Other Symbols

Symbols used on maps which do not fall under other general categories

Public/Private Pumping Station

Change of characteristic indicator (C.O.C.I.)

Invert Level

Summit

**Areas**

Lines denoting areas of underground surveys, etc.

Agreement

Operational Site

Chamber

Tunnel

Conduit Bridge

## Other Sewer Types (Not Operated or Maintained by Thames Water)

Foul Sewer

Surface Water Sewer

Combined Sewer

Gulley

Culverted Watercourse

Proposed

Abandoned Sewer

**Notes:**

1) All levels associated with the plans are to Ordnance Datum Newlyn.

2) All measurements on the plans are metric.

3) Arrows (on gravity fed sewers) or flecks (on rising mains) indicate direction of flow.

4) Most private pipes are not shown on our plans, as in the past, this information has not been recorded.

5) 'na' or '0' on a manhole level indicates that data is unavailable.

6) The text appearing alongside a sewer line indicates the internal diameter of the pipe in milimetres. Text next to a manhole indicates the manhole reference number and should not be taken as a measurement. If you are unsure about any text or symbology present on the plan, please contact a member of Property Insight on 0845 070 9148.

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